

Patent claims

1. Use of an article whose surface exhibits a composite material in full or in parts, the composite material consisting of a non-metallic substrate containing at least one polymer, and a metallic layer present thereon and deposited without external current, having an adhesive strength of at least 4 N/mm^2 , as moulding tool.
2. Use according to claim 1 characterised in that the standard deviation of the adhesive strength at six different measured value points distributed over the surface of the composite material is maximum 25 % of the arithmetic mean.
3. Use according to claim 1 or 2 characterised in that
 - a) the surface of the article is not chemically pretreated before the application of the metallic layer deposited without electric current; and
 - b) the metallic layer is not applied by thermal spraying, CVD, PVD or laser treatment.
4. Use according to one of claims 1 to 3 characterised in that the non-metallic substrate is the surface of the article.
5. Use according to one of claims 1 or 2 characterised in that the non-metallic substrate is not the surface of the article.
6. Use according to one of the preceding claims characterised in that the boundary present between the non-metallic substrate and the metallic layer exhibits a roughness with an R_z value of maximum $35 \mu\text{m}$.
7. Use according to one of the preceding claims characterised in that the boundary present between the non-metallic substrate and the metallic layer exhibits a roughness with an R_a value of maximum $5 \mu\text{m}$.
8. Use according to one of the preceding claims characterised in that the non-metallic substrate contains at least one fibre-reinforced polymer, in particular a polymer reinforced with carbon fibre and the diameter of the fibre is less than $10 \mu\text{m}$.

9. Use according to one of claims 1 to 5 characterised in that the non-metallic substrate contains at least one fibre-reinforced polymer, in particular a polymer reinforced with glass fibre and the diameter of the fibre is more than 10 μm .
10. Use according to claim 9 characterised in that the boundary present between the non-metallic substrate and the metallic layer exhibits a roughness with an R_a value of maximum 10 μm .
11. Use according to one of claims 9 or 10 characterised in that the boundary present between the non-metallic substrate and the metallic layer exhibits a roughness with an R_z value of maximum 100 μm .
12. Use according to one of preceding claims characterised in that the polymer is selected from the group of polyamide, polyvinyl chloride, polystyrene, epoxy resin, polyether ether ketone, polyoxymethylene, polyformaldehyde, polyacetal, polyurethane, polyether imide, polyphenyl sulphone, polyphenylene sulphide, polyarylamide, polycarbonate and polyimide.
13. Use according to claim 12 characterised in that the metallic layer exhibits an adhesive strength of at least 12 N/mm^2
14. Use according to one of claims 1 to 11 characterised in that the non-metallic substrate is polypropylene or polytetrafluoroethylene,
15. Use according to one of the preceding claims characterised in that the standard deviation of the adhesive strength amounts to maximum 25 %, in particular maximum 15 %, of the arithmetic mean.
16. Use according to one of the preceding claims characterised in that the metal layer deposited without electric current is a metal alloy or metal dispersion layer.
17. Use according to one of the preceding claims characterised in that the metal layer deposited without external current is a copper, nickel or gold layer.
18. Use according to one of the preceding claims characterised in that the metal dispersion layer deposited without external current is a copper, nickel or gold layer with embedded non-metallic particles.

19. Use according to claim 18 characterised in that the non-metallic particles exhibit a hardness of more than 1,500 HV and are selected from the group of silicon carbide, corundum, diamond and tetraboron carbide.
20. Use according to claim 18 or 19 characterised in that the non-metallic particles exhibit friction-reducing properties and are selected from the group of polytetrafluoroethylene, molybdenum sulphide, cubic boron nitride and tin sulphide.
21. Use according to one of the preceding claims characterised in that, onto the metallic layer deposited without external current, a layer of aluminium, titanium or their alloys is applied whose surface is anodically oxidised or ceramics-treated.
22. Use according to claim 21 characterised in that one or several metallic layers are also arranged between the metallic layer deposited without external current and the layer of aluminium, titanium or their alloys.
23. Use according to claim 21 or 22 characterised in that the surface of the article is a ceramic oxide layer of aluminium, titanium or their alloys, which layer is coloured black by foreign ion embedments.
24. Use according to one of the preceding claims as punching, casting or conversion tool.